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PROBSTMAYRIA VIVIPARA (PROBSTMAYR, 1865) RANSOM, 1907, A NEMATODE OF HORSES HERETOFORE UNREPORTED FROM THE UNITED STATES

By B. H. RANSOM

WITH ONE PLATE

Among the numerous species of roundworms which infest the large intestine of the horse there is one species which is notable on account of its very small size and the enormous numbers in which is may occur.

This species was first described by a German writer, Probstmayr (1865), under the name of *Oxyuris vivipara.* That author examined the caeca of fifty horses, and in a few cases the remainder of the large intestine, during the months from November to May, and found the worms in question present in seven caeca out of the entire number examined. No specimens of the male sex were encountered. The females measured 2.45 mm. long by 0.11 mm. wide at the level of the bulb of the esophagus. The distance from the anal opening to the tip of the slender-pointed tail was 0.86 mm. Three stages in the development of the females were noted, namely, immature females, pregnant females, and females which had given birth to young. The pregnant females contained two embryos which could be forced out of the vulva by pressure. These embryos measured 1.48 to 1.59 mm. long by 0.04 to 0.10 mm. wide, and were completely developed with the exception of the genital organs.

Perroncito (1882: 337) noted the presence of this species in Italy, having found millions of individuals in the large intestine of a horse. He also makes reference to it in a later work (1886: 300–301) and considers that it should be placed more properly in one of the two genera, *Rhabdonema* or *Anguillula.*

Fiorentini (1890: 21–25), who met with this species in two out of a number of horses examined by him in Italy, has given, with the exception of a few slight misinterpretations and omissions, a fairly accurate and complete description based on specimens of the female.

Railliet (1893: 549) gives a short description based on the accounts of previous authors and assigns the worm definitely to the genus *Anguillula.*

The very small transparent *Oxyuris* from the large intestine of an Egyptian donkey, mentioned by Looss (1902: 119), possibly belongs to the species under discussion.

Jerke (1902: 113–127), in post-mortem examinations of thirty-eight horses and asses found the parasite in fifteen cases, distributed throughout the entire large intestine. More fortunate than earlier observers, he discovered the male, and in two cases found it in rather large numbers, in the proportion of one male to about twenty-five females. He gives the maximum length of the full-grown female as 2.9 mm. with a width of 0.095 mm.; the male measured 2.6 mm. in length by 0.084 mm. in width. According to his interpretation the mouth is surrounded by three lips. The spicules Jerke describes as equal, measuring 0.072 mm. in length by 0.0075 mm. in average width. He saw no papillae on the tail of the male.

In addition to a number of pages of anatomical description with figures he makes a few remarks in regard to the life history and considers that infection takes place from the ingestion of food or water which has been contaminated by feces from infected animals. In support of this view he mentions the fact that the worms remain alive in manure for four or five days after deposition. Having gained entrance to the body the worms are able to multiply indefinitely, completing their entire life cycle within the body and thus differing from most parasitic nematodes which at some stage must pass to the exterior and again re-enter a host before their development is finished.

Linstow (1905: 534) places the form in the genus *Strongyloides.*

In June, 1904, I collected and preserved in formalin a large number of specimens of the nematode in question from the large intestine of a horse examined, *post mortem,* near Livingston, Montana, and have since collected it in the District of Columbia.

On the basis of this material I have found it possible to describe this little nematode somewhat more fully than has been done heretofore, and as it presents rather marked differences from the types of established nematode genera, I have ventured to propose for the species *vivipara* a new genus, *Probstmayria*.

Genus PROBSTMAYRIA Ransom, 1907

Generic Diagnosis.—Small spindle-shaped forms truncated anteriorly and with a long, gradually attenuated, acutely pointed tail. Cuticula thin, transparent, and free from spines or setae. Mouth with six lips. A small lateral organ of unknown function in relation with each lateral lip and the anterior portion of the body. Pharynx elongated, cylindrical. Esophagus with two portions, anterior portion long and slender, posterior portion shorter, pyriform, with a bulb containing a denticular apparatus. Anus about two-thirds the length of the body from the anterior end. Male with two short, nearly equal spicules, without bursa, and with a number of pairs of small postanal papillae. Vulva of female at about the middle of the body. Eggs few, hatching in the uterus, and developing into embryos which at birth exactly resemble the parent except that the sexual organs are undeveloped.

Type species: *Probstmayria vivipara* (Probstmayr, 1865) Ransom, 1907.

Probstmayria vivipara (Pobstmayr, 1865) Ransom, 1907

SYNONYMY:

Oxyuris vivipara Probstmayr, 1865: 178–180. Zürn, 1882: 252, 253. Perroncito, 1882: 337. *Idem,* 1886: 300–301 (under the name Ossiuride vivipara). *Idem,* (?) 1902: 424–425. Neumann, 1888: 370, 375. *Idem,* 1892 (French ed.): 393, 399. *Idem,* 1892 (English ed.): 403, 410. Fiorentini, 1890: 21–25, Pl. Railliet, 1887: 48 (as synonym of *Rhabdonema vivipara*). *Idem,* 1893: 549 (as synonym of *Anguillula vivipara*). Schneidemühl, 1896: 324.

Rhabdonema vivipara (Probstmayr) Railliet, 1887: 48.

Anguillula vivipara (Probstmayr) Railliet, 1893: 549. Vaullegeard, 1901: 136. Jerke, 1903: 113–127, pl. 1, figs. 1–9.

[?] *Oxyuris* sp., Looss, 1902: 119.

Strongyloides viviparus (Probstmayr) Linstow, 1905: 534.

Probstmayria vivipara (Probstmayr) Ransom, 1907: pl. 11, figs. 1–8.

Specific Diagnosis.—Small, transparent, 2.5 to 3 mm. long when mature, spindle-shaped, gradually diminishing in diameter towards both ends, truncated anteriorly, ending in a very acute point posteriorly. Mouth surrounded by a very transparent cuticular rim or collar, consisting apparently of six bulbous lips, two dorsal, two ventral, and one on each side [according to Jerke (1902) there are but three lips]. A slender filament extends through each ventral and dorsal lip from the base to the anterior surface upon which is a very small papilla in relation with the distal end of the filament. A similar filament in each lateral lip(?). In relation with and partly imbedded in the outer surface of the base of each lateral lip the bulbous cuticular expansion of an elongated organ, the remainder of which is located behind the mouth collar beneath the cuticula. Diameter of mouth collar 18 μ in immature individuals to 22 μ in males and parturient females, height 5 to 7 μ. Pharynx elongated, cylindrical, lined with thick yellowish cuticula; 40 μ long in immature individuals and in the male, 40 to 50 μ long in parturient females, and 9 to 13 μ in diameter, including an outer muscular layer; diameter of the tube formed by the chitinous lining, 4 to 6 μ; chitinous portion of the anterior one-sixth of pharynx roughened, irregularly thickened, slightly bulbous, and lacking the muscular layer, with a number of irregular, tooth-like projections extending outward into the substance of the mouth collar; posterior five-sixths of chitinous lining of pharynx transversely striated with fine regular corrugations. Esophagus consisting of two portions, a long, slender anterior portion, and a short pyriform portion with a cylindrical stem and with a denticular apparatus in the bulb; length of anterior portion 240 to 255 μ in immature individuals, 295 to 320 μ in parturient females, and 300 μ in the male; diameter of anterior portion near its middle 18 μ in immature individuals and in the male, and 18 to 22 μ in parturient females; posterior portion 80 to 88 μ long in immature individuals, 105 to 115 μ in parturient females, and 105 μ in the male; diameter of the esophageal bulb 36 to 40 μ in immature individuals, 50 μ in the male, and 45 to 55 μ in parturient females. Intestine, at its beginning, usually very wide, with a large lumen; more slender and nearly uniform in diameter, with a narrow lumen, throughout the remainder of its almost straight course to the anus; diameter of intestine at its beginning 64 to 76 μ and near the middle 30 to 54 μ in immature individuals, in the male 95 μ at its beginning and 65 μ near the middle, in parturient females 100 to 115 μ at its beginning and 62 to 72 μ near the middle; in the female there is a short, narrow rectum surrounded by 3 or 4 large gland cells. Anus 1.35 to 1.4 mm. from the anterior end of body in immature individuals, 1.75 mm. in the male, and 1.8 to 2 mm. in parturient females. A nerve ring surrounds the anterior portion of the esophagus near its middle at a distance from the anterior end of the body of 168 to 185 μ in immature individuals, 200 μ in the male, and 200 to 215 μ in parturient females. Ventral of the esophageal bulb a small vesicle opening to the exterior through the excretory pore which is situated on the ventral surface of the body 335 to 360 μ from the anterior end in immature individuals, 425 μ in the male, and 415 to 440 μ in parturient females.

Male.—Length 2.7 mm. Width at level of nerve ring 60 μ, at excretory pore 80 μ, almost uniform (95 μ) from a short distance posteriad from the excretory pore nearly to the anus, in the region of the latter becoming reduced to 75 μ, and gradually decreasing toward the tip of the acutely pointed tail. A single testicle extending anteriad as far as the esophagus, posteriorly its deferent portion uniting with the end of the intestine on its ventral surface to form the cloaca opening at the anus. Spicules two, similar, slightly curved and pointed, nearly equal in size, 67 and 58 μ long, respectively, and 6.7 μ in diameter. On the ventral surface of the tail six pairs of small papillae, the successive pairs being from 20 to 25 μ apart, and the last or anterior pair 80 μ posterior of the anus.

Female.—Immature individuals 2 to 2.2 mm. long, with sexual organs not yet apparent, measuring in diameter 45 to 55 μ at the level of the nerve ring, 58 to 67 μ at the excretory pore, 64 to 76 μ at a point about half way between the excretory pore and anus, and 50 to 55 μ at the anus. Parturient females 2.7 to 2.9 mm. long, measuring in diameter 63 to 72 μ at the level of the nerve ring, 88 to 100 μ at the excretory pore, 100 to 115 μ at a point about half way between the excretory pore and anus, 88 to 112 μ at the vulva, and 72 to 82 μ at the anus. Vulva in parturient females located about half way between the two extremities of the body, *i. e.*, 1.35 to 1.38 mm. posteriad from the anterior end. Vagina very short. Uterus bicornate, one horn extending anteriad, the other posteriad from the point of junction with the vagina, size and extent depending upon stage of development of the embryos contained therein. Ovaries two, each consisting of a short coiled tubule, continuous with the distal end of each horn of the uterus. Eggs elongate, oval, with thin shell; size of eggs in uterus 58 by 40 μ to 100 by 75 μ, according to stage of development. Only two to four eggs present in the uterus at the same time.

Life History.—Reproduction sexual. The eggs hatch in the uterus and the embryos develop to a length of 1.8 mm. or more before they are born. At the time of birth the latter exactly resemble the parent with the exception that the sexual organs are not yet developed. The embryos apparently may develop directly into adults without leaving the intestine of the horse. Life history outside the host unknown.

Hosts.—Horse (*Equus caballus*); ass (*Equus asinus*).

Habitat.—Large intestine.

Geographical Distribution.—Germany (Probstmayr, Jerke), Italy (Perroncito, Fiorentini), ?Egypt (Looss), Montana, District of Columbia (Ransom).

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EXPLANATION OF PLATE

Plate II

Fig. 1. Lateral view of male. × 54.

Fig. 2. Lateral view of posterior end of male, showing the terminal portions of the intestine and vas deferens, the cloaca and its opening, the spicules, and the post-anal papillae. × 190.

Fig. 3. Dorsal view of anterior end of body, showing the dorsal lips with their papillae. × 400.

Fig. 4. Optical horizontal section through anterior end of body showing the lateral lips, the lateral organs, the pharynx, and beginning of esophagus. × 400.

Fig. 5. Lateral view of anterior end of body showing the lateral lip, lateral organ, dorsal and ventral lips, and papillae. × 400.

Fig. 6. Lateral view of immature form in which the genital organs are not yet developed. × 54.

Fig. 7. Lateral view of young female, showing an egg in one horn of the uterus. × 54.

Fig. 8. Lateral view of parturient female with uterus containing a well developed embryo, a second less developed embryo, and two eggs. × 54.

PLATE II